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IMPACT OF HIGH SPEED CIVIL TRANSPORTS ON STRATOSPHERIC OZONE: A 2-D MODEL INVESTIGATION

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Abstract

This study investigates the effect on stratospheric ozone from a fleet of proposed High Speed Civil Transports (HSCTs). The new LLNL 2-D operator-split chemical-radiative-transport model of the troposphere and stratosphere is used for this HSCT investigation. This model is integrated in a diurnal manner, using an implicit numerical solver (SMVGEARII, Jacobson, 1995). Therefore, rate coefficients derived during a model integration are not modified by any sort of diurnal average factor (unlike the previous LLNL 2-D model architecture). This model, like previous versions of the LLNL 2-D model, also does not make any assumptions on lumping of chemical species into families. Comparisons to model-derived HSCT assessment of ozone change are made, both to the previous LLNL 2-D model and to other models from the international assessment modeling community (Stolarski, et al., 1995). In addition, the new LLNL 2-D model chemical solution approach is evaluated against data taken from a recent ER2 aircraft campaign. Here, aircraft measurements of simultaneous trace constituents distributions during the Stratospheric Photochemistry, Aerosol and Dynamics Expedition (SPADE), allow one to determine the odd-oxygen loss partitioning among chemical families (Wennberg et al., 1994). Very good agreement for odd-oxygen loss partitioning is found between the model and the SPADE data. In addition, the sensitivity to the NO_x emission index and sulfate surface area density is also explored.

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